

**WHAT IS CLAIMED IS:**

1. A method for generating a preamble sequence in an orthogonal frequency division multiplexing (OFDM) communication system having  $m$  subcarriers in a frequency domain, comprising the steps of:

grouping the  $m$  subcarriers by  $n$  subcarriers, where  $n$  is less than  $m$ , so as to generate  $p$  subchannels; and

assigning null data to subcarriers except the  $n$  subcarriers assigned to the subchannels, assigning data of a given sequence to at least one subchannel selected from the  $p$  subchannels, assigning null data to subchannels not selected from the  $p$  subchannels, and thereafter performing inverse fast Fourier transform (IFFT) for transforming the data into time-domain data.

2. The method of claim 1, wherein if  $m=256$ ,  $p=4$ , the number of the selected subchannels is 1, the selected one subchannel is a subchannel #1 which is a first subchannel among the 4 subchannels, then the given sequence is  $P111subch(-100:100)$  given by

$P111subch(-100:100)=\{$

	-1 0 +1 0 +1 0 -1 0 -1 0 -1 0	[-100:-89] subch#1
20	0 0 0 0 0 0 0 0 0 0 0 0	[- 88:-76] subch#2
	0 0 0 0 0 0 0 0 0 0 0 0	[- 75:-64] subch#3
	0 0 0 0 0 0 0 0 0 0 0 0	[- 63:-51] subch#4
	+1 0 +1 0 +1 0 -1 0 +1 0 -1 0	[- 50:-39] subch#1
	0 0 0 0 0 0 0 0 0 0 0 0	[- 38:-26] subch#2
25	0 0 0 0 0 0 0 0 0 0 0 0	[- 25:-14] subch#3
	0 0 0 0 0 0 0 0 0 0 0 0	[- 13:- 1] subch#4
	0	[DC]

```

0 +1 0 -1 0 +1 0 +1 0 -1 0 -1 0      [ 1: 13] subch#1
0 0 0 0 0 0 0 0 0 0 0 0      [ 14: 25] subch#2
0 0 0 0 0 0 0 0 0 0 0 0      [ 26: 38] subch#3
0 0 0 0 0 0 0 0 0 0 0 0      [ 39: 50] subch#4
5 0 -1 0 -1 0 -1 0 -1 0 +1 0 -1 0      [ 51: 63] subch#1
0 0 0 0 0 0 0 0 0 0 0 0      [ 64: 75] subch#2
0 0 0 0 0 0 0 0 0 0 0 0      [ 76: 88] subch#3
0 0 0 0 0 0 0 0 0 0 0 0      [ 89:100] subch#4

)*sqrt(2)*sqrt(2)

```

10 where  $(n_x:n_y)$  represents subcarriers of  $n_x^{\text{th}}$  to  $n_y^{\text{th}}$  subcarriers.

3. The method of claim 1, wherein if  $m=256$ ,  $p=4$ , the number of the selected subchannels is 1, the selected one subchannel is a subchannel #1 which is a first subchannel among the 4 subchannels, then the given sequence is

15 P211subch(-100:100) given by

```

P211subch(-100:100)={
0 0 0 0 0 0 0 0 0 0 0 0      [-100:-89] subch#3
-1 0 +1 0 +1 0 -1 0 -1 0 -1 0      [- 88:-76] subch#1
0 0 0 0 0 0 0 0 0 0 0 0      [- 75:-64] subch#4
20 0 0 0 0 0 0 0 0 0 0 0 0      [- 63:-51] subch#2
+1 0 -1 0 -1 0 +1 0 -1 0 -1 0      [- 50:-39] subch#1
0 0 0 0 0 0 0 0 0 0 0 0      [- 38:-26] subch#3
0 0 0 0 0 0 0 0 0 0 0 0      [- 25:-14] subch#2
0 0 0 0 0 0 0 0 0 0 0 0      [- 13:- 1] subch#4
25 0                               [DC]

```

```

0 +1 0 -1 0 +1 0 -1 0 +1 0 -1 0      [ 1: 13] subch#1
0 0 0 0 0 0 0 0 0 0 0 0      [ 14: 25] subch#3
0 0 0 0 0 0 0 0 0 0 0 0      [ 26: 38] subch#2
0 0 0 0 0 0 0 0 0 0 0 0      [ 39: 50] subch#4
5 0 0 0 0 0 0 0 0 0 0 0 0      [ 51: 63] subch#3
-1 0 -1 0 +1 0 +1 0 +1 0 +1 0      [ 64: 75] subch#1
0 0 0 0 0 0 0 0 0 0 0 0      [ 76: 88] subch#4
0 0 0 0 0 0 0 0 0 0 0 0      [ 89:100] subch#2

}*sqrt(2)*sqrt(2)

```

10 where  $(n_x:n_y)$  represents subcarriers of  $n_x^{\text{th}}$  to  $n_y^{\text{th}}$  subcarriers.

4. The method of claim 1, wherein if  $m=256$ ,  $p=4$ , the number of the selected subchannels is 1, the selected one subchannel is a subchannel #2 which is a second subchannel among the 4 subchannels, then the given sequence  
15 is P112subch(-100:100) given by

```

P112subch(-100:100)={
0 0 0 0 0 0 0 0 0 0 0 0      [-100:-89] subch#1
-1 0 -1 0 -1 0 +1 0 -1 0 +1 0      [- 88:-76] subch#2
0 0 0 0 0 0 0 0 0 0 0 0      [- 75:-64] subch#3
20 0 0 0 0 0 0 0 0 0 0 0 0      [- 63:-51] subch#4
0 0 0 0 0 0 0 0 0 0 0 0      [- 50:-39] subch#1
-1 0 +1 0 -1 0 -1 0 +1 0 -1 0 -1      [- 38:-26] subch#2
0 0 0 0 0 0 0 0 0 0 0 0      [- 25:-14] subch#3
0 0 0 0 0 0 0 0 0 0 0 0      [- 13:- 1] subch#4
25 0                                [DC]

```

	0 0 0 0 0 0 0 0 0 0 0 0 0	[ 1: 13] subch#1
	+1 0 -1 0 -1 0 +1 0 +1 0 +1 0	[ 14: 25] subch#2
	0 0 0 0 0 0 0 0 0 0 0 0 0	[ 26: 38] subch#3
	0 0 0 0 0 0 0 0 0 0 0 0 0	[ 39: 50] subch#4
5	0 0 0 0 0 0 0 0 0 0 0 0 0	[ 51: 63] subch#1
	+1 0 -1 0 +1 0 +1 0 +1 0 -1 0	[ 64: 75] subch#2
	0 0 0 0 0 0 0 0 0 0 0 0 0	[ 76: 88] subch#3
	0 0 0 0 0 0 0 0 0 0 0 0 0	[ 89:100] subch#4

)\*sqrt(2)\*sqrt(2)

10 where ( $n_x:n_y$ ) represents subcarriers of  $n_x^{\text{th}}$  to  $n_y^{\text{th}}$  subcarriers.

5. The method of claim 1, wherein if  $m=256$ ,  $p=4$ , the number of the selected subchannels is 1, the selected one subchannel is a subchannel #2 which is a second subchannel among the 4 subchannels, then the given sequence  
15 is P212subch(-100:100) given by

P212subch(-100:100)={

	0 0 0 0 0 0 0 0 0 0 0 0 0	[-100:-89] subch#3
	0 0 0 0 0 0 0 0 0 0 0 0 0	[- 88:-76] subch#1
	0 0 0 0 0 0 0 0 0 0 0 0 0	[- 75:-64] subch#4
20	0 -1 0 +1 0 -1 0 +1 0 -1 0 +1 0	[- 63:-51] subch#2
	0 0 0 0 0 0 0 0 0 0 0 0 0	[- 50:-39] subch#1
	0 0 0 0 0 0 0 0 0 0 0 0 0	[- 38:-26] subch#3
	0 -1 0 -1 0 +1 0 +1 0 +1 0 +1	[- 25:-14] subch#2
	0 0 0 0 0 0 0 0 0 0 0 0 0	[- 13:- 1] subch#4
25	0	[DC]
	0 0 0 0 0 0 0 0 0 0 0 0 0	[ 1: 13] subch#1

```

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0      [ 14: 25] subch#3
-1 0 +1 0 -1 0 -1 0 +1 0 -1 0 -1 0 -1 0      [ 26: 38] subch#2
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0      [ 39: 50] subch#4
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0      [ 51: 63] subch#3
5      0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0      [ 64: 75] subch#1
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0      [ 76: 88] subch#4
0 +1 0 +1 0 -1 0 -1 0 +1 0 +1 0 +1 0 +1 0      [ 89:100] subch#2

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}\*sqrt(2)\*sqrt(2)

where ( $n_x:n_y$ ) represents subcarriers of  $n_x^{\text{th}}$  to  $n_y^{\text{th}}$  subcarriers.

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6. The method of claim 1, wherein if  $m=256$ ,  $p=4$ , the number of the selected subchannels is 1, the selected one subchannel is a subchannel #3 which is a third subchannel among the 4 subchannels, then the given sequence is P113subch(-100:100) given by

```

15 P113subch(-100:100)={
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0      [-100:-89] subch#1
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0      [- 88:-76] subch#2
0 -1 0 -1 0 +1 0 -1 0 -1 0 -1 0 -1 0      [- 75:-64] subch#3
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0      [- 63:-51] subch#4
20      0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0      [- 50:-39] subch#1
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0      [- 38:-26] subch#2
0 -1 0 +1 0 -1 0 -1 0 +1 0 +1 0 +1 0      [- 25:-14] subch#3
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0      [- 13:- 1] subch#4
0                                          [DC]
25      0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0      [ 1: 13] subch#1
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0      [ 14: 25] subch#2

```

```

-1 0 +1 0 +1 0 +1 0 -1 0 -1 0 -1      [ 26: 38] subch#3
0 0 0 0 0 0 0 0 0 0 0 0 0              [ 39: 50] subch#4
0 0 0 0 0 0 0 0 0 0 0 0 0              [ 51: 63] subch#1
0 0 0 0 0 0 0 0 0 0 0 0 0              [ 64: 75] subch#2
5    -1 0 +1 0 +1 0 +1 0 +1 0 -1 0 +1      [ 76: 88] subch#3
      0 0 0 0 0 0 0 0 0 0 0 0 0          [ 89:100] subch#4

)*sqrt(2)*sqrt(2)

```

where  $(n_x:n_y)$  represents subcarriers of  $n_x^{\text{th}}$  to  $n_y^{\text{th}}$  subcarriers.

- 10        7.        The method of claim 1, wherein if  $m=256$ ,  $p=4$ , the number of the selected subchannels is 1, the selected one subchannel is a subchannel #3 which is a third subchannel among the 4 subchannels, then the given sequence is P213subch(-100:100) given by

```

P213subch(-100:100)={
15    -1 0 -1 0 +1 0 +1 0 -1 0 -1 0      [-100:-89] subch#3
      0 0 0 0 0 0 0 0 0 0 0 0 0          [- 88:-76] subch#1
      0 0 0 0 0 0 0 0 0 0 0 0 0          [- 75:-64] subch#4
      0 0 0 0 0 0 0 0 0 0 0 0 0          [- 63:-51] subch#2
      0 0 0 0 0 0 0 0 0 0 0 0 0          [- 50:-39] subch#1
20    +1 0 +1 0 -1 0 +1 0 +1 0 -1 0 +1      [- 38:-26] subch#3
      0 0 0 0 0 0 0 0 0 0 0 0 0          [- 25:-14] subch#2
      0 0 0 0 0 0 0 0 0 0 0 0 0          [- 13:- 1] subch#4
      0                                     [DC]
      0 0 0 0 0 0 0 0 0 0 0 0 0          [  1: 13] subch#1
25    -1 0 -1 0 -1 0 -1 0 +1 0 +1 0      [ 14: 25] subch#3
      0 0 0 0 0 0 0 0 0 0 0 0 0          [ 26: 38] subch#2

```

	0 0 0 0 0 0 0 0 0 0 0 0 0 0	[ 39: 50] subch#4
	0 -1 0 +1 0 -1 0 +1 0 -1 0 +1 0	[ 51: 63] subch#3
	0 0 0 0 0 0 0 0 0 0 0 0 0 0	[ 64: 75] subch#1
	0 0 0 0 0 0 0 0 0 0 0 0 0 0	[ 76: 88] subch#4
5	0 0 0 0 0 0 0 0 0 0 0 0 0 0	[ 89:100] subch#2

) \*sqrt(2) \*sqrt(2)

where  $(n_x:n_y)$  represents subcarriers of  $n_x^{\text{th}}$  to  $n_y^{\text{th}}$  subcarriers.

8. The method of claim 1, wherein if  $m=256$ ,  $p=4$ , the number of  
 10 the selected subchannels is 1, the selected one subchannel is a subchannel #4  
 which is a fourth subchannel among the 4 subchannels, then the given sequence  
 is P114subch(-100:100) given by

P114subch(-100:100)={

	0 0 0 0 0 0 0 0 0 0 0 0 0 0	[-100:-89] subch#1
15	0 0 0 0 0 0 0 0 0 0 0 0 0 0	[- 88:-76] subch#2
	0 0 0 0 0 0 0 0 0 0 0 0 0 0	[- 75:-64] subch#3
	0 -1 0 +1 0 +1 0 -1 0 -1 0 -1 0	[- 63:-51] subch#4
	0 0 0 0 0 0 0 0 0 0 0 0 0 0	[- 50:-39] subch#1
	0 0 0 0 0 0 0 0 0 0 0 0 0 0	[- 38:-26] subch#2
20	0 0 0 0 0 0 0 0 0 0 0 0 0 0	[- 25:-14] subch#3
	0 +1 0 +1 0 +1 0 -1 0 +1 0 -1 0	[- 13:- 1] subch#4
	0	[DC]
	0 0 0 0 0 0 0 0 0 0 0 0 0 0	[ 1: 13] subch#1
	0 0 0 0 0 0 0 0 0 0 0 0 0 0	[ 14: 25] subch#2
25	0 0 0 0 0 0 0 0 0 0 0 0 0 0	[ 26: 38] subch#3
	0 +1 0 -1 0 +1 0 +1 0 -1 0 -1	[ 39: 50] subch#4

0 0 0 0 0 0 0 0 0 0 0 0 0	[ 51: 63] subch#1
0 0 0 0 0 0 0 0 0 0 0 0 0	[ 64: 75] subch#2
0 0 0 0 0 0 0 0 0 0 0 0 0	[ 76: 88] subch#3
0 -1 0 -1 0 -1 0 -1 0 +1 0 -1	[ 89:100] subch#4

5    )\*sqrt(2)\*sqrt(2)

where  $(n_x:n_y)$  represents subcarriers of  $n_x^{\text{th}}$  to  $n_y^{\text{th}}$  subcarriers.

9.     The method of claim 1, wherein if  $m=256$ ,  $p=4$ , the number of the selected subchannels is 1, the selected one subchannel is a subchannel #4 which is a fourth subchannel among the 4 subchannels, then the given sequence is P214subch(-100:100) given by

10    P214subch(-100:100)={

0 0 0 0 0 0 0 0 0 0 0 0 0	[-100:-89] subch#3
0 0 0 0 0 0 0 0 0 0 0 0 0	[- 88:-76] subch#1
15    0 -1 0 -1 0 -1 0 -1 0 +1 0 +1	[- 75:-64] subch#4
0 0 0 0 0 0 0 0 0 0 0 0 0	[- 63:-51] subch#2
0 0 0 0 0 0 0 0 0 0 0 0 0	[- 50:-39] subch#1
0 0 0 0 0 0 0 0 0 0 0 0 0	[- 38:-26] subch#3
0 0 0 0 0 0 0 0 0 0 0 0 0	[- 25:-14] subch#2
20    0 +1 0 -1 0 +1 0 -1 0 +1 0 -1 0	[- 13:- 1] subch#4
0	[DC]
0 0 0 0 0 0 0 0 0 0 0 0 0	[ 1: 13] subch#1
0 0 0 0 0 0 0 0 0 0 0 0 0	[ 14: 25] subch#3
0 0 0 0 0 0 0 0 0 0 0 0 0	[ 26: 38] subch#2
25    0 +1 0 +1 0 -1 0 +1 0 +1 0 -1	[ 39: 50] subch#4
0 0 0 0 0 0 0 0 0 0 0 0 0	[ 51: 63] subch#3



```

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0      [ 64: 75] subch#1
+1 0 +1 0 +1 0 +1 0 -1 0 -1 0 +1      [ 76: 88] subch#4
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0      [ 89:100] subch#2

)*sqrt(2)*sqrt(2)

```

5 where  $(n_x:n_y)$  represents subcarriers of  $n_x^{\text{th}}$  to  $n_y^{\text{th}}$  subcarriers.

10. The method of claim 1, wherein if  $m=256$ ,  $p=4$ , the number of the selected subchannels is 2, the selected two subchannel are a subchannel #1 which is a first subchannel and a subchannel #3 which is a third subchannel among the 4 subchannels, then the given sequence is P12(1+3)subch(-100:100) given by

```

P12(1+3) subch(-100:100)={
-1 0 +1 0 +1 0 -1 0 +1 0 -1 0      [-100:-89] subch#1+subch#3
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0      [- 88:-76] subch#2+subch#4
15 0 -1 0 +1 0 +1 0 +1 0 +1 0 +1      [- 75:-64] subch#1+subch#3
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0      [- 63:-51] subch#2+subch#4
+1 0 +1 0 +1 0 -1 0 -1 0 -1 0      [- 50:-39] subch#1+subch#3
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0      [- 38:-26] subch#2+subch#4
0 -1 0 +1 0 -1 0 -1 0 -1 0 -1      [- 25:-14] subch#1+subch#3
20 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0      [- 13:- 1] subch#2+subch#4
0                                         [DC]
0 +1 0 +1 0 +1 0 -1 0 +1 0 +1 0      [  1: 13] subch#1+subch#3
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0      [ 14: 25] subch#2+subch#4
-1 0 +1 0 +1 0 -1 0 +1 0 +1 0 -1      [ 26: 38] subch#1+subch#3
25 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0      [ 39: 50] subch#2+subch#4
0 +1 0 +1 0 -1 0 +1 0 -1 0 +1 0      [ 51: 63] subch#1+subch#3

```

```

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0      [ 64: 75] subch#2+subch#4
-1 0 -1 0 -1 0 +1 0 -1 0 -1 0 -1 0 -1 0      [ 76: 88] subch#1+subch#3
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0      [ 89:100] subch#2+subch#4

}*sqrt(2)*sqrt(2)

```

5 where  $(n_x:n_y)$  represents subcarriers of  $n_x^{\text{th}}$  to  $n_y^{\text{th}}$  subcarriers.

11. The method of claim 1, wherein if  $m=256$ ,  $p=4$ , the number of the selected subchannels is 2, the selected two subchannel are a subchannel #1 which is a first subchannel and a subchannel #2 which is a second subchannel  
10 among the 4 subchannels, then the given sequence is P22(1+2)subch(-100:100) given by

```

P22(1+2)subch(-100:100)={
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0      [-100:-89] subch#3+subch#4
+1 0 +1 0 +1 0 +1 0 -1 0 -1 0 -1 0 -1 0      [- 88:-76] subch#1+subch#2
15 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0      [- 75:-64] subch#3+subch#4
0 +1 0 -1 0 +1 0 +1 0 +1 0 +1 0      [- 63:-51] subch#1+subch#2
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0      [- 50:-39] subch#3+subch#4
-1 0 +1 0 -1 0 +1 0 +1 0 +1 0 +1 0      [- 38:-26] subch#1+subch#2
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0      [- 25:-14] subch#3+subch#4
20 0 -1 0 +1 0 +1 0 -1 0 -1 0 -1 0      [- 13:- 1] subch#1+subch#2
0                                          [DC]
0 +1 0 -1 0 -1 0 +1 0 +1 0 +1 0      [  1: 13] subch#1+subch#2
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0      [ 14: 25] subch#3+subch#4
-1 0 +1 0 +1 0 -1 0 -1 0 +1 0 -1 0      [ 26: 38] subch#1+subch#2
25 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0      [ 39: 50] subch#3+subch#4
0 +1 0 -1 0 +1 0 +1 0 +1 0 +1 0      [ 51: 63] subch#1+subch#2

```

```

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0      [ 64: 75] subch#3+subch#4
-1 0 -1 0 -1 0 +1 0 +1 0 -1 0 +1      [ 76: 88] subch#1+subch#2
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0      [ 89:100] subch#3+subch#4

)*sqrt(2)*sqrt(2)

```

5 where ( $n_x:n_y$ ) represents subcarriers of  $n_x^{\text{th}}$  to  $n_y^{\text{th}}$  subcarriers.

12. The method of claim 1, wherein if  $m=256$ ,  $p=4$ , the number of the selected subchannels is 2, the selected two subchannel are a subchannel #2 which is a second subchannel and a subchannel #4 which is a fourth subchannel  
 10 among the 4 subchannels, then the given sequence is P12(2+4)subch(-100:100) given by

```

P12(2+4)subch(-100:100)=(
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0      [-100:-89] subch#1+subch#3
-1 0 -1 0 +1 0 -1 0 +1 0 -1 0 +1      [- 88:-76] subch#2+subch#4
15 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0      [- 75:-64] subch#1+subch#3
0 -1 0 +1 0 -1 0 +1 0 +1 0 -1 0      [- 63:-51] subch#2+subch#4
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0      [- 50:-39] subch#1+subch#3
-1 0 -1 0 +1 0 +1 0 -1 0 +1 0 -1      [- 38:-26] subch#2+subch#4
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0      [- 25:-14] subch#1+subch#3
20 0 -1 0 +1 0 -1 0 +1 0 +1 0 -1 0      [- 13:- 1] subch#2+subch#4
0                                          [DC]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0      [ 1: 13] subch#1+subch#3
+1 0 +1 0 +1 0 -1 0 +1 0 +1 0      [ 14: 25] subch#2+subch#4
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0      [ 26: 38] subch#1+subch#3
25 0 +1 0 +1 0 -1 0 -1 0 +1 0 +1      [ 39: 50] subch#2+subch#4
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0      [ 51: 63] subch#1+subch#3

```

-1 0 -1 0 -1 0 -1 0 +1 0 -1 0	[ 64: 75] subch#2+subch#4
0 0 0 0 0 0 0 0 0 0 0 0	[ 76: 88] subch#1+subch#3
0 +1 0 +1 0 +1 0 -1 0 -1 0 -1	[ 89:100] subch#2+subch#4

}\*sqrt(2)\*sqrt(2)

5 where  $(n_x:n_y)$  represents subcarriers of  $n_x^{\text{th}}$  to  $n_y^{\text{th}}$  subcarriers.

13. The method of claim 1, wherein if  $m=256$ ,  $p=4$ , the number of the selected subchannels is 2, the selected two subchannel are a subchannel #3 which is a third subchannel and a subchannel #4 which is a fourth subchannel among the 4 subchannels, then the given sequence is P22(3+4)subch(-100:100) given by

P22(3+4)subch(-100:100)={

+1 0 -1 0 +1 0 +1 0 -1 0 +1 0	[-100:-89] subch#3+subch#4
0 0 0 0 0 0 0 0 0 0 0 0	[- 88:-76] subch#1+subch#2
0 +1 0 +1 0 +1 0 -1 0 +1 0 +1	[- 75:-64] subch#3+subch#4
0 0 0 0 0 0 0 0 0 0 0 0	[- 63:-51] subch#1+subch#2
+1 0 -1 0 +1 0 +1 0 -1 0 +1 0	[- 50:-39] subch#3+subch#4
0 0 0 0 0 0 0 0 0 0 0 0	[- 38:-26] subch#1+subch#2
0 -1 0 +1 0 -1 0 +1 0 -1 0 +1	[- 25:-14] subch#3+subch#4
0 0 0 0 0 0 0 0 0 0 0 0	[- 13:- 1] subch#1+subch#2
0	[DC]
0 0 0 0 0 0 0 0 0 0 0 0	[ 1: 13] subch#1+subch#2
-1 0 +1 0 -1 0 -1 0 -1 0 +1 0	[ 14: 25] subch#3+subch#4
0 0 0 0 0 0 0 0 0 0 0 0	[ 26: 38] subch#1+subch#2
0 +1 0 +1 0 +1 0 -1 0 -1 0 -1	[ 39: 50] subch#3+subch#4
0 0 0 0 0 0 0 0 0 0 0 0	[ 51: 63] subch#1+subch#2

```

-1 0 +1 0 -1 0 -1 0 -1 0 +1 0      [ 64: 75] subch#3+subch#4
0 0 0 0 0 0 0 0 0 0 0 0      [ 76: 88] subch#1+subch#2
0 +1 0 -1 0 -1 0 +1 0 +1 0 +1      [ 89:100] subch#3+subch#4

}*sqrt(2)*sqrt(2)

```

5 where ( $n_x:n_y$ ) represents subcarriers of  $n_x^{\text{th}}$  to  $n_y^{\text{th}}$  subcarriers.

14. The method of claim 1, wherein all of the subcarriers except the  $n$  subcarriers assigned to the subchannels are subcarriers corresponding to an interference-removed component between a DC component and the subcarriers.

10

15. An apparatus for generating a preamble sequence in an orthogonal frequency division multiplexing (OFDM) communication system having  $m$  subcarriers in a frequency domain, comprising:

a preamble sequence generator for generating the preamble sequence so that data of a given preamble sequence is assigned to at least one subchannel selected from  $p$  subchannels generated by grouping the  $m$  subcarriers by  $n$  subcarriers, where  $n$  is less than  $m$ , and null data is assigned to subchannels not selected from the  $p$  subchannels; and

an inverse fast Fourier transformer (IFFT) for receiving the preamble sequence, assigning null data to subcarriers except the  $n$  subcarriers assigned to the subchannels, and thereafter performing inverse fast Fourier transform for transforming the data into time-domain data.

16. The apparatus of claim 15, wherein if  $m=256$ ,  $p=4$ , the number of the selected subchannels is 1, the selected one subchannel is a subchannel #1 which is a first subchannel among the 4 subchannels, then the given sequence is  $P111\text{subch}(-100:100)$  given by

```

P111subch(-100:100)={
-1 0 +1 0 +1 0 -1 0 -1 0 -1 0      [-100:-89] subch#1

```



```

-1 0 +1 0 +1 0 -1 0 -1 0 -1 0      [- 88:-76] subch#1
0 0 0 0 0 0 0 0 0 0 0 0      [- 75:-64] subch#4
0 0 0 0 0 0 0 0 0 0 0 0      [- 63:-51] subch#2
+1 0 -1 0 -1 0 +1 0 -1 0 -1 0      [- 50:-39] subch#1
5    0 0 0 0 0 0 0 0 0 0 0 0      [- 38:-26] subch#3
0 0 0 0 0 0 0 0 0 0 0 0      [- 25:-14] subch#2
0 0 0 0 0 0 0 0 0 0 0 0      [- 13:- 1] subch#4
0                                     [DC]
0 +1 0 -1 0 +1 0 -1 0 +1 0 -1 0      [  1: 13] subch#1
10   0 0 0 0 0 0 0 0 0 0 0 0      [ 14: 25] subch#3
0 0 0 0 0 0 0 0 0 0 0 0      [ 26: 38] subch#2
0 0 0 0 0 0 0 0 0 0 0 0      [ 39: 50] subch#4
0 0 0 0 0 0 0 0 0 0 0 0      [ 51: 63] subch#3
-1 0 -1 0 +1 0 +1 0 +1 0 +1 0      [ 64: 75] subch#1
15   0 0 0 0 0 0 0 0 0 0 0 0      [ 76: 88] subch#4
0 0 0 0 0 0 0 0 0 0 0 0      [ 89:100] subch#2

}*sqrt(2)*sqrt(2)

```

where  $(n_x:n_y)$  represents subcarriers of  $n_x^{\text{th}}$  to  $n_y^{\text{th}}$  subcarriers.

20        18.     The apparatus of claim 15, wherein if  $m=256$ ,  $p=4$ , the number of the selected subchannels is 1, the selected one subchannel is a subchannel #2 which is a second subchannel among the 4 subchannels, then the given sequence is P112subch(-100:100) given by

```

P112subch(-100:100)={
25      0 0 0 0 0 0 0 0 0 0 0 0      [-100:-89] subch#1

```

	-1 0 -1 0 -1 0 +1 0 -1 0 +1 0 +1	[- 88:-76] subch#2
	0 0 0 0 0 0 0 0 0 0 0 0	[- 75:-64] subch#3
	0 0 0 0 0 0 0 0 0 0 0 0	[- 63:-51] subch#4
	0 0 0 0 0 0 0 0 0 0 0 0	[- 50:-39] subch#1
5	-1 0 +1 0 -1 0 -1 0 +1 0 -1 0 -1	[- 38:-26] subch#2
	0 0 0 0 0 0 0 0 0 0 0 0	[- 25:-14] subch#3
	0 0 0 0 0 0 0 0 0 0 0 0	[- 13:- 1] subch#4
	0	[DC]
	0 0 0 0 0 0 0 0 0 0 0 0	[ 1: 13] subch#1
10	+1 0 -1 0 -1 0 +1 0 +1 0 +1 0	[ 14: 25] subch#2
	0 0 0 0 0 0 0 0 0 0 0 0	[ 26: 38] subch#3
	0 0 0 0 0 0 0 0 0 0 0 0	[ 39: 50] subch#4
	0 0 0 0 0 0 0 0 0 0 0 0	[ 51: 63] subch#1
	+1 0 -1 0 +1 0 +1 0 +1 0 -1 0	[ 64: 75] subch#2
15	0 0 0 0 0 0 0 0 0 0 0 0	[ 76: 88] subch#3
	0 0 0 0 0 0 0 0 0 0 0 0	[ 89:100] subch#4

}\*sqrt(2)\*sqrt(2)

where  $(n_x:n_y)$  represents subcarriers of  $n_x^{\text{th}}$  to  $n_y^{\text{th}}$  subcarriers.

20      19.      The apparatus of claim 15, wherein if  $m=256$ ,  $p=4$ , the number of the selected subchannels is 1, the selected one subchannel is a subchannel #2 which is a second subchannel among the 4 subchannels, then the given sequence is P212subch(-100:100) given by

25	0 0 0 0 0 0 0 0 0 0 0 0	[-100:-89] subch#3
	0 0 0 0 0 0 0 0 0 0 0 0	[- 88:-76] subch#1



```

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0      [- 75:-64] subch#4
0 -1 0 +1 0 -1 0 +1 0 -1 0 +1 0      [- 63:-51] subch#2
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0      [- 50:-39] subch#1
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0      [- 38:-26] subch#3
5 0 -1 0 -1 0 +1 0 +1 0 +1 0 +1      [- 25:-14] subch#2
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0      [- 13:- 1] subch#4
0                                          [DC]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0      [  1: 13] subch#1
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0      [ 14: 25] subch#3
10 -1 0 +1 0 -1 0 -1 0 +1 0 -1 0 -1      [ 26: 38] subch#2
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0      [ 39: 50] subch#4
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0      [ 51: 63] subch#3
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0      [ 64: 75] subch#1
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0      [ 76: 88] subch#4
15 0 +1 0 +1 0 -1 0 -1 0 +1 0 +1      [ 89:100] subch#2
} *sqrt(2) *sqrt(2)

```

where  $(n_x:n_y)$  represents subcarriers of  $n_x^{\text{th}}$  to  $n_y^{\text{th}}$  subcarriers.

20. The apparatus of claim 15, wherein if  $m=256$ ,  $p=4$ , the number  
 20 of the selected subchannels is 1, the selected one subchannel is a subchannel #3  
 which is a third subchannel among the 4 subchannels, then the given sequence is  
 P113subch(-100:100) given by

```

P113subch(-100:100)={
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0      [-100:-89] subch#1
25 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0      [- 88:-76] subch#2
0 -1 0 -1 0 +1 0 -1 0 -1 0 -1      [- 75:-64] subch#3

```

	0 0 0 0 0 0 0 0 0 0 0 0 0	[- 63:-51] subch#4
	0 0 0 0 0 0 0 0 0 0 0 0 0	[- 50:-39] subch#1
	0 0 0 0 0 0 0 0 0 0 0 0 0	[- 38:-26] subch#2
	0 -1 0 +1 0 -1 0 -1 0 +1 0 +1	[- 25:-14] subch#3
5	0 0 0 0 0 0 0 0 0 0 0 0 0	[- 13:- 1] subch#4
	0	[DC]
	0 0 0 0 0 0 0 0 0 0 0 0 0	[ 1: 13] subch#1
	0 0 0 0 0 0 0 0 0 0 0 0 0	[ 14: 25] subch#2
	-1 0 +1 0 +1 0 +1 0 -1 0 -1 0 -1	[ 26: 38] subch#3
10	0 0 0 0 0 0 0 0 0 0 0 0 0	[ 39: 50] subch#4
	0 0 0 0 0 0 0 0 0 0 0 0 0	[ 51: 63] subch#1
	0 0 0 0 0 0 0 0 0 0 0 0 0	[ 64: 75] subch#2
	-1 0 +1 0 +1 0 +1 0 +1 0 -1 0 +1	[ 76: 88] subch#3
	0 0 0 0 0 0 0 0 0 0 0 0 0	[ 89:100] subch#4

15  $\sqrt{2} \sqrt{2}$

where  $(n_x:n_y)$  represents subcarriers of  $n_x^{\text{th}}$  to  $n_y^{\text{th}}$  subcarriers.

21. The apparatus of claim 15, wherein if  $m=256$ ,  $p=4$ , the number of the selected subchannels is 1, the selected one subchannel is a subchannel #3 which is a third subchannel among the 4 subchannels, then the given sequence is

20 P213subch(-100:100) given by

P213subch(-100:100)={

	-1 0 -1 0 +1 0 +1 0 -1 0 -1 0	[-100:-89] subch#3
	0 0 0 0 0 0 0 0 0 0 0 0 0	[- 88:-76] subch#1
25	0 0 0 0 0 0 0 0 0 0 0 0 0	[- 75:-64] subch#4
	0 0 0 0 0 0 0 0 0 0 0 0 0	[- 63:-51] subch#2

	0 0 0 0 0 0 0 0 0 0 0 0 0 0	[- 50:-39] subch#1
	+1 0 +1 0 -1 0 +1 0 +1 0 -1 0 +1	[- 38:-26] subch#3
	0 0 0 0 0 0 0 0 0 0 0 0 0 0	[- 25:-14] subch#2
	0 0 0 0 0 0 0 0 0 0 0 0 0 0	[- 13:- 1] subch#4
5	0	[DC]
	0 0 0 0 0 0 0 0 0 0 0 0 0 0	[ 1: 13] subch#1
	-1 0 -1 0 -1 0 -1 0 +1 0 +1 0	[ 14: 25] subch#3
	0 0 0 0 0 0 0 0 0 0 0 0 0 0	[ 26: 38] subch#2
	0 0 0 0 0 0 0 0 0 0 0 0 0 0	[ 39: 50] subch#4
10	0 -1 0 +1 0 -1 0 +1 0 -1 0 +1 0	[ 51: 63] subch#3
	0 0 0 0 0 0 0 0 0 0 0 0 0 0	[ 64: 75] subch#1
	0 0 0 0 0 0 0 0 0 0 0 0 0 0	[ 76: 88] subch#4
	0 0 0 0 0 0 0 0 0 0 0 0 0 0	[ 89:100] subch#2

)\*sqrt(2)\*sqrt(2)

15 where  $(n_x:n_y)$  represents subcarriers of  $n_x^{\text{th}}$  to  $n_y^{\text{th}}$  subcarriers.

22. The apparatus of claim 15, wherein if  $m=256$ ,  $p=4$ , the number of the selected subchannels is 1, the selected one subchannel is a subchannel #4 which is a fourth subchannel among the 4 subchannels, then the given sequence

20 is P114subch(-100:100) given by

P114subch(-100:100)={

	0 0 0 0 0 0 0 0 0 0 0 0 0 0	[-100:-89] subch#1
	0 0 0 0 0 0 0 0 0 0 0 0 0 0	[- 88:-76] subch#2
	0 0 0 0 0 0 0 0 0 0 0 0 0 0	[- 75:-64] subch#3
25	0 -1 0 +1 0 +1 0 -1 0 -1 0 -1 0	[- 63:-51] subch#4
	0 0 0 0 0 0 0 0 0 0 0 0 0 0	[- 50:-39] subch#1

	0 0 0 0 0 0 0 0 0 0 0 0 0	[- 38:-26] subch#2
	0 0 0 0 0 0 0 0 0 0 0 0 0	[- 25:-14] subch#3
	0 +1 0 +1 0 +1 0 -1 0 +1 0 -1 0	[- 13:- 1] subch#4
	0	[DC]
5	0 0 0 0 0 0 0 0 0 0 0 0 0	[ 1: 13] subch#1
	0 0 0 0 0 0 0 0 0 0 0 0 0	[ 14: 25] subch#2
	0 0 0 0 0 0 0 0 0 0 0 0 0	[ 26: 38] subch#3
	0 +1 0 -1 0 +1 0 +1 0 -1 0 -1	[ 39: 50] subch#4
	0 0 0 0 0 0 0 0 0 0 0 0 0	[ 51: 63] subch#1
10	0 0 0 0 0 0 0 0 0 0 0 0 0	[ 64: 75] subch#2
	0 0 0 0 0 0 0 0 0 0 0 0 0	[ 76: 88] subch#3
	0 -1 0 -1 0 -1 0 -1 0 +1 0 -1	[ 89:100] subch#4

```
}*sqrt(2)*sqrt(2)
```

where  $(n_x:n_y)$  represents subcarriers of  $n_x^{\text{th}}$  to  $n_y^{\text{th}}$  subcarriers.

15

23. The apparatus of claim 15, wherein if  $m=256$ ,  $p=4$ , the number of the selected subchannels is 1, the selected one subchannel is a subchannel #4 which is a fourth subchannel among the 4 subchannels, then the given sequence is  $P_{214\text{subch}}(-100:100)$  given by

20 p214subch(-100:100)={

```

0 0 0 0 0 0 0 0 0 0 0 0 0      [-100:-89] subch#3
0 0 0 0 0 0 0 0 0 0 0 0 0      [- 88:-76] subch#1
0 -1 0 -1 0 -1 0 -1 0 +1 0 +1    [- 75:-64] subch#4
0 0 0 0 0 0 0 0 0 0 0 0 0      [- 63:-51] subch#2
0 0 0 0 0 0 0 0 0 0 0 0 0      [- 50:-39] subch#1
0 0 0 0 0 0 0 0 0 0 0 0 0      [- 38:-26] subch#3

```

	0 0 0 0 0 0 0 0 0 0 0 0 0 0	[- 25:-14] subch#2
	0 +1 0 -1 0 +1 0 -1 0 +1 0 -1 0	[- 13:- 1] subch#4
	0	[DC]
	0 0 0 0 0 0 0 0 0 0 0 0 0 0	[ 1: 13] subch#1
5	0 0 0 0 0 0 0 0 0 0 0 0 0 0	[ 14: 25] subch#3
	0 0 0 0 0 0 0 0 0 0 0 0 0 0	[ 26: 38] subch#2
	0 +1 0 +1 0 -1 0 +1 0 +1 0 -1	[ 39: 50] subch#4
	0 0 0 0 0 0 0 0 0 0 0 0 0 0	[ 51: 63] subch#3
	0 0 0 0 0 0 0 0 0 0 0 0 0 0	[ 64: 75] subch#1
10	+1 0 +1 0 +1 0 +1 0 -1 0 -1 0 +1	[ 76: 88] subch#4
	0 0 0 0 0 0 0 0 0 0 0 0 0 0	[ 89:100] subch#2

}\*sqrt(2)\*sqrt(2)

where  $(n_x:n_y)$  represents subcarriers of  $n_x^{\text{th}}$  to  $n_y^{\text{th}}$  subcarriers.

15        24.        The apparatus of claim 15, wherein if  $m=256$ ,  $p=4$ , the number of the selected subchannels is 2, the selected two subchannel are a subchannel #1 which is a first subchannel and a subchannel #3 which is a third subchannel among the 4 subchannels, then the given sequence is P12(1+3)subch(-100:100) given by

20    P12(1+3)subch(-100:100)={

	-1 0 +1 0 +1 0 -1 0 +1 0 -1 0	[-100:-89] subch#1+subch#3
	0 0 0 0 0 0 0 0 0 0 0 0 0 0	[- 88:-76] subch#2+subch#4
	0 -1 0 +1 0 +1 0 +1 0 +1 0 +1	[- 75:-64] subch#1+subch#3
	0 0 0 0 0 0 0 0 0 0 0 0 0 0	[- 63:-51] subch#2+subch#4
25	+1 0 +1 0 +1 0 -1 0 -1 0 -1 0	[- 50:-39] subch#1+subch#3
	0 0 0 0 0 0 0 0 0 0 0 0 0 0	[- 38:-26] subch#2+subch#4

	0 -1 0 +1 0 -1 0 -1 0 -1 0 -1	[- 25:-14] subch#1+subch#3
	0 0 0 0 0 0 0 0 0 0 0 0	[- 13:- 1] subch#2+subch#4
	0	[DC]
	0 +1 0 +1 0 +1 0 -1 0 +1 0 +1 0	[ 1: 13] subch#1+subch#3
5	0 0 0 0 0 0 0 0 0 0 0 0	[ 14: 25] subch#2+subch#4
	-1 0 +1 0 +1 0 -1 0 +1 0 +1 0 -1	[ 26: 38] subch#1+subch#3
	0 0 0 0 0 0 0 0 0 0 0 0	[ 39: 50] subch#2+subch#4
	0 +1 0 +1 0 -1 0 +1 0 -1 0 +1 0	[ 51: 63] subch#1+subch#3
	0 0 0 0 0 0 0 0 0 0 0 0	[ 64: 75] subch#2+subch#4
10	-1 0 -1 0 -1 0 +1 0 -1 0 -1 0 -1	[ 76: 88] subch#1+subch#3
	0 0 0 0 0 0 0 0 0 0 0 0	[ 89:100] subch#2+subch#4

}\*sqrt(2)\*sqrt(2)

where  $(n_x:n_y)$  represents subcarriers of  $n_x^{\text{th}}$  to  $n_y^{\text{th}}$  subcarriers.

- 15      25.      The apparatus of claim 15, wherein if  $m=256$ ,  $p=4$ , the number of the selected subchannels is 2, the selected two subchannel are a subchannel #1 which is a first subchannel and a subchannel #2 which is a second subchannel among the 4 subchannels, then the given sequence is  $P22(1+2)\text{subch}(-100:100)$  given by

20  $P22(1+2)\text{subch}(-100:100)=\{$

	0 0 0 0 0 0 0 0 0 0 0 0	[-100:-89] subch#3+subch#4
	+1 0 +1 0 +1 0 +1 0 -1 0 -1 0 -1	[- 88:-76] subch#1+subch#2
	0 0 0 0 0 0 0 0 0 0 0 0	[- 75:-64] subch#3+subch#4
	0 +1 0 -1 0 +1 0 +1 0 +1 0 +1 0	[- 63:-51] subch#1+subch#2
25	0 0 0 0 0 0 0 0 0 0 0 0	[- 50:-39] subch#3+subch#4
	-1 0 +1 0 -1 0 +1 0 +1 0 +1 0 +1	[- 38:-26] subch#1+subch#2

	0 0 0 0 0 0 0 0 0 0 0 0	[- 25:-14] subch#3+subch#4
	0 -1 0 +1 0 +1 0 -1 0 -1 0 -1 0	[- 13:- 1] subch#1+subch#2
	0	[DC]
	0 +1 0 -1 0 -1 0 +1 0 +1 0 +1 0	[ 1: 13] subch#1+subch#2
5	0 0 0 0 0 0 0 0 0 0 0 0	[ 14: 25] subch#3+subch#4
	-1 0 +1 0 +1 0 -1 0 -1 0 +1 0 -1	[ 26: 38] subch#1+subch#2
	0 0 0 0 0 0 0 0 0 0 0 0	[ 39: 50] subch#3+subch#4
	0 +1 0 -1 0 +1 0 +1 0 +1 0 +1 0	[ 51: 63] subch#1+subch#2
	0 0 0 0 0 0 0 0 0 0 0 0	[ 64: 75] subch#3+subch#4
10	-1 0 -1 0 -1 0 +1 0 +1 0 -1 0 +1	[ 76: 88] subch#1+subch#2
	0 0 0 0 0 0 0 0 0 0 0 0	[ 89:100] subch#3+subch#4

}\*sqrt(2)\*sqrt(2)

where ( $n_x:n_y$ ) represents subcarriers of  $n_x^{\text{th}}$  to  $n_y^{\text{th}}$  subcarriers.

15        26.        The apparatus of claim 15, wherein if  $m=256$ ,  $p=4$ , the number of the selected subchannels is 2, the selected two subchannel are a subchannel #2 which is a second subchannel and a subchannel #4 which is a fourth subchannel among the 4 subchannels, then the given sequence is P12(2+4)subch(-100:100) given by

20    P12(2+4)subch(-100:100)={

	0 0 0 0 0 0 0 0 0 0 0 0	[-100:-89] subch#1+subch#3
	-1 0 -1 0 +1 0 -1 0 +1 0 -1 0 +1	[- 88:-76] subch#2+subch#4
	0 0 0 0 0 0 0 0 0 0 0 0	[- 75:-64] subch#1+subch#3
	0 -1 0 +1 0 -1 0 +1 0 +1 0 -1 0	[- 63:-51] subch#2+subch#4
25	0 0 0 0 0 0 0 0 0 0 0 0	[- 50:-39] subch#1+subch#3
	-1 0 -1 0 +1 0 +1 0 -1 0 +1 0 -1	[- 38:-26] subch#2+subch#4

	0 0 0 0 0 0 0 0 0 0 0 0	[- 25:-14] subch#1+subch#3
	0 -1 0 +1 0 -1 0 +1 0 +1 0 -1 0	[- 13:- 1] subch#2+subch#4
	0	[DC]
	0 0 0 0 0 0 0 0 0 0 0 0	[ 1: 13] subch#1+subch#3
5	+1 0 +1 0 +1 0 -1 0 +1 0 +1 0	[ 14: 25] subch#2+subch#4
	0 0 0 0 0 0 0 0 0 0 0 0	[ 26: 38] subch#1+subch#3
	0 +1 0 +1 0 -1 0 -1 0 +1 0 +1	[ 39: 50] subch#2+subch#4
	0 0 0 0 0 0 0 0 0 0 0 0	[ 51: 63] subch#1+subch#3
	-1 0 -1 0 -1 0 -1 0 +1 0 -1 0	[ 64: 75] subch#2+subch#4
10	0 0 0 0 0 0 0 0 0 0 0 0	[ 76: 88] subch#1+subch#3
	0 +1 0 +1 0 +1 0 -1 0 -1 0 -1	[ 89:100] subch#2+subch#4

}\*sqrt(2)\*sqrt(2)

where  $(n_x:n_y)$  represents subcarriers of  $n_x^{\text{th}}$  to  $n_y^{\text{th}}$  subcarriers.

15        27.        The apparatus of claim 15, wherein if  $m=256$ ,  $p=4$ , the number of the selected subchannels is 2, the selected two subchannel are a subchannel #3 which is a third subchannel and a subchannel #4 which is a fourth subchannel among the 4 subchannels, then the given sequence is P22(3+4)subch(-100:100) given by

20    P22(3+4)subch(-100:100)={

	+1 0 -1 0 +1 0 +1 0 -1 0 +1 0	[-100:-89] subch#3+subch#4
	0 0 0 0 0 0 0 0 0 0 0 0	[- 88:-76] subch#1+subch#2
	0 +1 0 +1 0 +1 0 -1 0 +1 0 +1	[- 75:-64] subch#3+subch#4
	0 0 0 0 0 0 0 0 0 0 0 0	[- 63:-51] subch#1+subch#2
25	+1 0 -1 0 +1 0 +1 0 -1 0 +1 0	[- 50:-39] subch#3+subch#4
	0 0 0 0 0 0 0 0 0 0 0 0	[- 38:-26] subch#1+subch#2



	0 -1 0 +1 0 -1 0 +1 0 -1 0 +1	[- 25:-14] subch#3+subch#4
	0 0 0 0 0 0 0 0 0 0 0 0	[- 13:- 1] subch#1+subch#2
	0	[DC]
	0 0 0 0 0 0 0 0 0 0 0 0	[ 1: 13] subch#1+subch#2
5	-1 0 +1 0 -1 0 -1 0 -1 0 +1 0	[ 14: 25] subch#3+subch#4
	0 0 0 0 0 0 0 0 0 0 0 0	[ 26: 38] subch#1+subch#2
	0 +1 0 +1 0 +1 0 -1 0 -1 0 -1	[ 39: 50] subch#3+subch#4
	0 0 0 0 0 0 0 0 0 0 0 0	[ 51: 63] subch#1+subch#2
	-1 0 +1 0 -1 0 -1 0 -1 0 +1 0	[ 64: 75] subch#3+subch#4
10	0 0 0 0 0 0 0 0 0 0 0 0	[ 76: 88] subch#1+subch#2
	0 +1 0 -1 0 -1 0 +1 0 +1 0 +1	[ 89:100] subch#3+subch#4

)\*sqrt(2)\*sqrt(2)

where  $(n_x:n_y)$  represents subcarriers of  $n_x^{\text{th}}$  to  $n_y^{\text{th}}$  subcarriers.

- 15        28.    The apparatus of claim 15, wherein all of the subcarriers except the  $n$  subcarriers assigned to the subchannels are subcarriers corresponding to an interference-removed component between a DC component and the subcarriers.